Contents

List of symbols and abbreviations 9

1. Introduction. The aim and scope of the studies 11

2. X-ray scattering in liquids and binary solutions 13
2.1. Diffraction of X-rays by free molecules 13
2.2. General formulas for the diffraction by liquid and liquid solutions 16
2.3. A relation between X-ray diffraction and packing coefficient of molecules 19
2.4. Coordination numbers in liquid systems. 21

3. Experimental study of the diffraction by liquids and liquid solutions 23
3.1. An X-ray transmission diffractometer with a temperature camera for the study of liquid solutions 23
3.2. Conditions of X-ray scattered intensity measurements 26
3.3. Correcting the experimental data 27
3.4. Method for normalizing experimental X-ray intensities 27

4. Interpretation of the structure of non-dipolar solvent 29
4.1. X-ray scattering in liquid *p*-Xylene 29
4.2. Relations between mean amplitudes of vibration and corresponding internuclear distances 31
4.3. Structural results from X-ray diffraction 35

5. **X-ray diffraction investigation of molecular ordering in dipole liquids** 39
5.1. Determination of the molecular structure of *ortho*-, *meta*- and *para*-chloroanisole 39
5.2. Models of short-range order in liquid *ortho*-, *meta*- and *para*-chloroanisole from X-ray diffraction studies 45
5.3. Final remarks. The use of X-ray analysis in the studies of structure of dipolar liquids .. 48

6. X-ray analysis of intermolecular interactions in binary liquid solutions 51
6.1. The experimental results and interpretation 51

6.2. Approximates models arrangement of molecules in binary liquid solutions 54
6.3. Final remarks. The application of X-ray diffraction in the investigations of solutions of certain dipolar liquids with non-dipolar solvent 57

7. Conclusions 59

Literature 61